Current State and Future Vision in Online Distance Learning:

Accessibility of Inquiry Learning in an Online Learning Environment

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Introduction:

Technology and their trends seem as if they are changing so rapidly updates are available daily, or a new advertisement appears for the latest upgrades. From smartphones leaving users with virtually no need for a desktop computer, to virtual reality experiences with endless possibilities, distance education currently has a good hand to play in providing learners with accessible opportunities to flexibly immerse in the content being delivered. From the traditional face-to-face instruction to the online "distance" instruction, there are some significant similarities and differences.

Learning within the 21st century is a wonderful position to be in since you literally hold access to the world in the palm of your hand while your physical location is no longer an issue. Although this endless access is seemingly a blessing, if a learner is not accustomed to this online learning environment they could become overwhelmed with the content delivery in the time frames provided, directions and expectations may not be clear to the participant, or the participant may become disengaged with the class content. It is important when designing online courses to consider the various needs of the audience and adjust the accessibility of content created and shared.

As technologies are constantly changing, the definition for distance education is metamorphosing, but there are some common threads. The core theories behind teaching will remain the same, the learners still need to remember, interact with the content, and interact with one another to formulate their own understanding and experiences. The tools and support needed to facilitate communication, content delivery, and learning community do vary greatly from face-to-face environments to online learning environments causing branched learning theories (such as inquiry learning) to continue to grow and evolve allowing for a better understanding of how to address all learners needs who have access to content anytime, anywhere.

Theoretical Foundations:

Based on the reading of *Foundations of Educational Theory for Online Learning*, a conclusion can be drawn that many of the best educational theories remain relevant, and the same, from delivery of instruction face-to-face as it is online, however, the changing factor is the tools of delivery and the learning environments. A Cognitivist Learning Theory is applicable for both face-to-face and online because the focus is on how the learner processes and retains information which influences the learner to content interaction, thus the difference is how the learner will interact with the content. According to the Constructivist Learning Theory and Transformative Learning Theory, learners should be able to interact with their content to construct their own understanding which again works for both face-to-face and online. Inquiry leaning such as problem-based learning, project-based learning, and STEM design challenges are lesson delivery methods in which could support a transformative online learning experience. Finally, the Connectivist Learning Theory states that learners must work and interact with content in a community centered, "networked environment", which could be accomplished with face-to-face instruction through flipped or blended learning, however, the theory best support online, distance learning.

For example. a combination of these learning theories has been observed through the University of South Florida's Instructional Technology Online Master's program. Most of the

content is delineated in sequential order which reduces the cognitive load for students from repeated skills practiced or repetition of information building to a final product, which is supported by the Cognitivist Learning Theory. Some of the assignments have been to read information from various current sources, supported by the Connectivist Learning Theory, in which will be applied in creation of a product justification through an essay, supporting the Constructivist Learning Theory. Professors have utilized various forms of media from instructional videos, podcasts, and narrated slides to adapt the content to meet the varying needs of the learners. Courses are formatted with the three types of interactions in mind: learner-content, learner-instructor, and learner-learner. Through USF's Instructional Technology Master's program, there are always a comfortable balance of each interaction type which leaves the student feeling supported and having the opportunity to process the content at their own pace, in their own ways, whether internally or externally.

John Keller's ARCS Model of Motivation Design were written as an "overview of the major dimensions of human motivation, especially in the context of learning motivation, and how to create strategies and sustain motivation in each of the four areas." (Keller, 2010) **A**ttention is the analysis of the learners sustained interest in a topic or area of study. In order to keep the learner's attention, the content developer must question how they are going to keep the content delivery interesting and exciting for the learners. Three ways in which to sustain the learner's attention could be utilizing humor, relatable scenarios, or comparing the content with seemingly unrelatable metaphors. For example, when teaching about the flow of electrons a GIF could be used of a race-horse breaking off from the group to take a wide lead. This metaphor would be unexpected to the learner and relate the moving electron to the race-horse. Also, when delivering the content, use a variety of activities from week to week; students will become unmotivated when they expect the same work to be repeated. **R**elevance is a key to sustained motivation for an online learner. As a graduate student working full time, the importance of the content being covered, within life's time constraints, being relevant to the future goals of obtaining a degree and applying knowledge in a new career are crucial. Keller's three main categories of relevance are goal orientation, motive matching, and familiarity. A content developer can create as many exciting and relevant opportunities as they want, however, if the learner does not get feedback and feel **c**onfident, their motivation will quickly wain. By setting clear goals and providing rubrics, learners will feel more in control of their own success. Allowing for numerous opportunities to improve and reevaluate their thinking, possibly as simple as allowing for resubmission after feedback is provided, will ensure that learners feel supported along their journey. **S**atisfied learners will leave the course feeling rewarded, either intrinsically, extrinsically, or both. Learners want to know that their efforts were worth it and they have successfully met the instructors, as well as their own, goals for learning.

As online learners are largely responsible for their own motivations, the motivational regulation strategies are used to overcome the motivational obstacles that learners encounter during online content acquisition. ARCS motivational model can be utilized for the developer of the online course (facilitator) and although the motivational regulation strategies can be embedded within the course content, the learner will choose, or choose not to, use the strategies to increase motivation.

Motivational regulation strategy	Meaning
Enhancement of situational interest	using one's imagination to make a task more interesting
Enhancement of personal significance	imagining scenarios in which the task seems relevant to the real-world (role playing)
Mastery self-talk	focusing on the larger "picture"
Performance-approach self-talk	aiming to outperform other learners in the course
Performance-avoidance self-talk	avoiding conversations with those who do not positively influence emotions due to low performance
Environmental control	seeking a desirable study space
Self-consequating	rewarding one's self for accomplishing tasks/goals
Proximal goal setting	Analyzing the workload and applying time-management in order to complete tasks in a timely manner

Current Research:

While reading Self-determined blended learning**:** A Case Study of Blended Learning Design, the researchers gathering data about the accessibility and quality of participation when converting a traditionally face-to-face course into an online learning environment. Instructors better utilized the University's LMS to provide content materials and lectures online. Based on the survey findings of George-Walker and Keefe, most students whether on campus, or off campus, enjoyed the flexibility of attaining the lecture and course materials online, however, some students commented about their need for socialization, therefore they went to face-to-face lectures and participated in on campus activities. Due to all materials being online, most students enjoyed the flexibility of being able to work on course material at their own leisure, even working ahead if time allows. Some students commented about the blended learning opportunity being a bit overwhelming because this is a newer practice and they are new to university learning. Likewise, while analyzing the results of the Adapting a Residential Course to Web-Based Blended Learning article research study where an English I and II course for foreign language students was fully converted into the online format, they concluded that "designing blended learning opportunities for formal learning environments is a rising trend, and the community can benefit from the documented design process" (OZMEN, TEPE, TUZUN, 2018).

Based on this evidence a conclusion can be made that, if planned effectively, an online blended learning environment can be achieved- however, how do students feel about this method of learning? The article, Students' perceptions and attitudes towards asynchronous technological tools in blended-learning training to improve grammatical competence in English as a second language, conducted a study to gain higher education student opinions about the benefits of various technological tools while utilizing them to obtain English as a second language. The results found that "… students' perceptions and attitudes towards the technological tools used (podcast, videocast, online tests, online glossary and forums) were rather positive, although most of them state that they had not used them before. Most students emphasize the efficacy of the

blended-learning model designed via Moodle to improve their grammatical competence (parts of speech, kinds of sentences and word formation)." (Pinto-Llorente, Sanchez-Gomez, Garcia-Penalvo, Casillas-Martin, 2017)

Although research has proven that teachers are interested and have efficacy for preparing students for future STEM careers, proper training, curriculum, and learning environments cannot be founded due to nationalized testing and other forms of measurement which are solely focused on content standards. As found in Teachers' Readiness to Use Inquiry-based Learning: An Investigation of Teachers' Sense of Efficacy and Attitudes toward Inquiry-based Learning, volunteer participants from 13 varying countries, involving 12 partners, participated in inquiry-based activities, and web-based materials were developed to support guided inquiry via an online platform. By conducting an assessment using a TE scale, the groups were found to have answered 50% not familiar with IBL, and 50% quite familiar with IBL. Most teachers identified three barriers; system restrictions, classroom management, and resources. IBL has been recommended as an effective method to be used in classrooms (Rocard et al., 2007) with the aim to raise interest in STEM subjects and careers, which is one of the top priorities in current educational policies across Europe (Kearney, 2016). However, there seems to be a gap between what is written in the curricula and what goes on in the classrooms because IBL is not used by the teachers as much as expected by the Ark of Inquiry web platform in their science classes.

Recommendations:

For Online Instructors and Online Trainers

Distance learning is the ability to participate in an online learning environment where resources, media, and teacher guided materials are available through a PDS. Students can access materials needed at any time from any online location, however, due to facilitator digression, there may be synchronous meetings. Blended learning is a perfect "blend" of both the face to face learning environment and the distance learning environment. Participants have access to resources, media, and teacher guided materials through a Professional Development System as well, however, face to face, or asynchronous meetings may be held online for more directed collaboration or instruction.

Traditionally there are four models of blended learning. The rotation model which include station rotation, lab rotation, flipped classroom, and individual rotation, the flex model, the a la carte model, and the enriched virtual model. Each of these models has components of self-guided, student centered online learning which could be flexed to be completed at home to review the day's work, or to preview the next day' work. Blended learning is commonly taking place in facilities with higher education students, and taking place in lower middle to elementary grades with less fidelity and consistency. Perhaps some challenges are the federal and state restrictions of how time is being used for students per day/week per subject area, or perhaps it's the lack of technology available to students daily. Either way, this is an issue that needs to be addressed, as numerous studies have shown that student make more long-lasting impressions of learning if they have the voice and choice of when, how, and what to learn.

Inquiry based learning is another way to provide learners the education that they deserve. Some common forms of inquiry learning are confirmation, structured, guided, and open inquiry.

Confirmation inquiry is the most teacher centered form of instruction where the teacher plans the question and the inquiry procedures and students follow the instructions to find the predicted results. Structured inquiry is similar in that the teacher chooses the question and provides guidelines/parameters for the process, however, the students are in complete autonomy of the solution. Guided inquiry is when the students choose the procedures and solution, however the teacher has still provided the inquiry question. The most student-centered approach is the open inquiry where the students are in complete control of the question, procedures, solutions created, and even how those solutions may be presented. These levels of inquiry support the project and problem based learning approaches, which could focus on the product being developed, or the process in which students develop a solution.

Again, challenges for a blended learning, inquiry focused instruction could be simply based on the technology available to the learners, the age level being taught and the responsibilities being achieved, or the content being delivered, however, a blended learning environment is a wonderful way to differentiate for all learners because of the flexibility of materials available, learning styles, and collaboration with other offering a diverse community.

For Instructional Designers

As I have been presenting various hands-on STEM related professional developments in a blended environment utilizing emails, printed and digital materials, online videos, and opportunities for teachers to collaborate face-to-face and reflect via Flipgrid, I have come to realize with the technologies available now, this is all possible online as well. The base objectives of my current Makerspace PDs are:

- Create a working definition of a makerspace
- Explore various examples of makerspaces
- Collaborate to innovate how a makerspace could be implemented in your school/classroom
- Build an understanding of how to foster a STEM Mindset
- Discover a network of resources and support
- Investigate how to write inquiry based lessons through problem/project based learning activities

To convert this PD to become an online opportunity, I would utilize the blended and flipped instructional pedagogies. This Makerspace PD could be offered over two to three weeks with instructional videos, research or various blog articles to read, and a discussion topic in which they need to be prepared to collaborate about. However, with this being across a large school district, I would want to hold a synchronous meeting time one per week to get the lines of communication open about the ideas they had from the flipped classwork.

Since our district uses Microsoft products most frequently, I would utilize Microsoft Teams to organize the PD content into a channel titled “STEM PD: Makerspaces and Stem Mindset”. Educators who register for the training through our district’s PDS will be added as a member to the STEM PD Team. Within the STEM PD Team, I can create pages which will be organized by week of instruction, for example page one will be titled “Week 1: Planning the implementation of a Makerspace”, page two will be titled “Week 2: Fostering a STEM Mindset” and page three will be titled “Week 3: Instructional Pedagogies for Inquiry Based Learning”. Within the pages,

tabs can be set up for task topics where videos, articles, websites, and other instructions can be posted. Teams also allows for the administrator to create "Assignments" to the Team members; using this feature I will guide participants through the blended learning resources and allow them to reflect and create products/solutions which will be shared during the weekly synchronous meetings. If participants are unable to attend the synchronous meeting an alternative assignment will be posted that prior to the day of the synchronous meeting, a Flipgrid video (which is free for everyone now, thanks to the partnership with Microsoft) with their pre-recorded reflection will be required and reviewed during the synchronous meeting.

Some barriers to this delivery method would be a lack of working knowledge of how to navigate the Microsoft tools being utilized, therefore, perhaps PDS sign up will end a week prior to "Week 1" instruction and a week zero will be required for participants to sign up for the Microsoft Educator Community and the free Microsoft Teams and Flipgrid courses can be taken to become better acquainted with the tools. Participants can "Follow" the instructor, in this case myself, where I can check to see that they have participated in the courses and earned their badge/certificate via their profile.

For a Better Learning Environment

Just like with face to face courses, in an online environment, facilitators must meet the individual needs of their students. With an ocean of tools available, facilitators can easily choose what will work best to meet the individual needs of learners who are perhaps learning English as their second or even third language, learners who are visually impaired, learners who are auditorily impaired, or learners with specific learning disabilities. No student should be hindered from extending their knowledge simply because of the online learning environment.

There are laws in place which protect learner's opportunities for accessibilities online which are supported by the Section 504 of the Rehabilitation Act of 1973 and Americans with Disabilities Act of 1990. These laws require higher education facilities to have accessible online materials which would be retrieved in the traditional face to face course for distance learning students.

> "'Accessible' means a person with a disability is afforded the opportunity to acquire the same information, engage in the same interactions, and enjoy the same services as a person without a disability in an equally effective and equally integrated manner, with substantially equivalent ease of use. The person with a disability must be able to obtain the information as fully, equally, and independently as a person without a disability." (Burns, 2013)

Microsoft, for example, has a plethora of accessibility tools available for free. When presenting to an audience, capture your live speech into live subtitles using the Microsoft Translator's Presenter Translator. When reading online documents for courses, sometimes the website content can become very distracting- using Microsoft Edge's Reading View within the Learning Tools can help blur and fade information on the page besides the indicated area in which you are currently reading. Within Microsoft software products, the Learning Tools feature can read text aloud, break words apart by syllable, or identify words by parts of speech. This feature uses a human voice, which people learn best from, in which to read aloud imported or created content, creating an ideal "on the go" learning environment. Learning Tools can also translate text into

over 60 languages. Want to work by typing without a keyboard? Learning Tools Dictate can dictate over 20 languages allowing for a flexible working environment for the distance education student.

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